Fairbanks PM_{2.5} Planning 2nd in a Series: Modeling and Source Apportionment

August 18, 2011



- PM_{2.5} and Public Health
- Fairbanks PM_{2.5} Sources
- Methods available to determine source contributions to PM_{2.5} concentrations
- Modeling issues and assessments underway
- Schedule to prepare Plan
- Control measure choices

Overview (cont.)

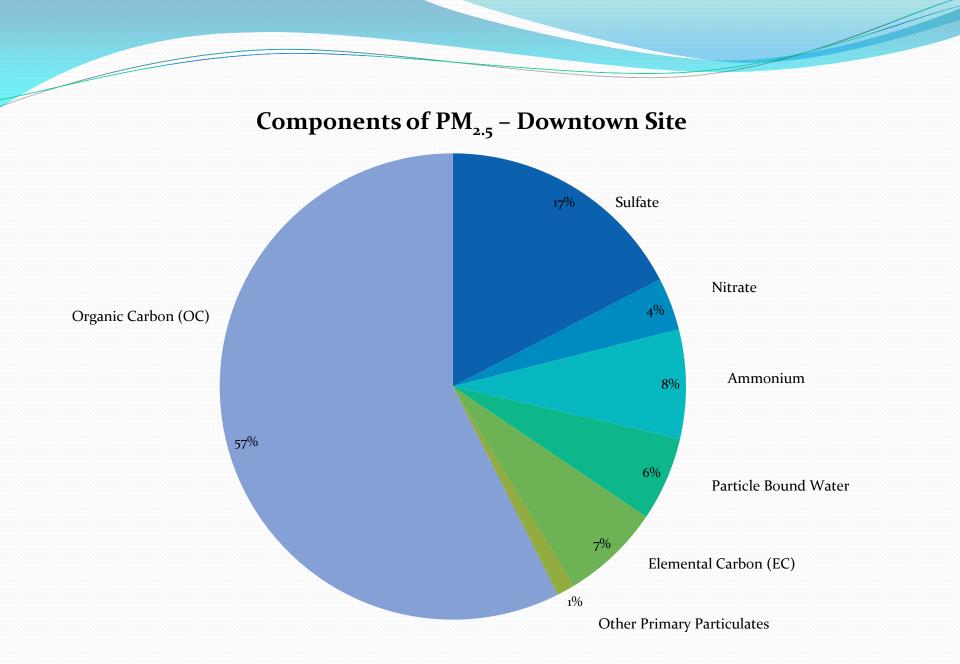
- Series of Assembly Briefings Planned:
 - Overview and emission inventory development (July)
 - Modeling/Source apportionment (Today)
 - Regulatory framework
 - Control Measures
 - Progress towards attainment

Source Apportionment

- What does it mean?
 - Sources = cars, trucks, power plants, snow machines, wood stoves, oil stoves, etc.
 - Apportionment = % of mass on each filter from each source
- Why is it important?
 - Key to selecting controls is understanding relative contribution from each source
 - Larger sources are more effective targets for controls

Preliminary 2008 Nonattainment Area Emission Estimates by Source (tons per day)

Source	PM _{2.5}	SO ₂	NOx	VOC	NH ₃
Industrial	0.39	7.07	13.03	0.50	0.45
Area	1.82	3.28	1.90	3.62	0.00
On-Road	0.18	0.03	9.53	3.41	0.29
Non-Road	0.10	0.00	0.09	4.47	0.00
Totals	2.49	10.39	24.55	11.99	0.74



Methods to Determine Sources

- Emissions estimates and meteorology
- Location/common sense
- Statistics
- Chemistry
- Dispersion

How Do We Figure Out Which Sources to Control?

- Magnitude of emissions
- Location in nonattainment area
- Stack height
- Wind direction relative to population and monitors
- Effect of temperature on emissions
- Public versus private
- Cost/ease of control
- Feasibility Practicality

What Modeling Help Does EPA Offer?

- Support to Borough/DEC on developing models for Fairbanks' Air Quality Plan
 - Meteorological modeling
 - Inventory modeling
 - Configured photochemical model
 - Refined dispersion and receptor models

What Does the EPA Look for in Air Quality Plans?

 Demonstration that science supports interpretation of modeling results and the ability to reach attainment

Collection and use of local data to characterize emissions and meteorology

Modeling conditions that cause PM_{2.5} violations

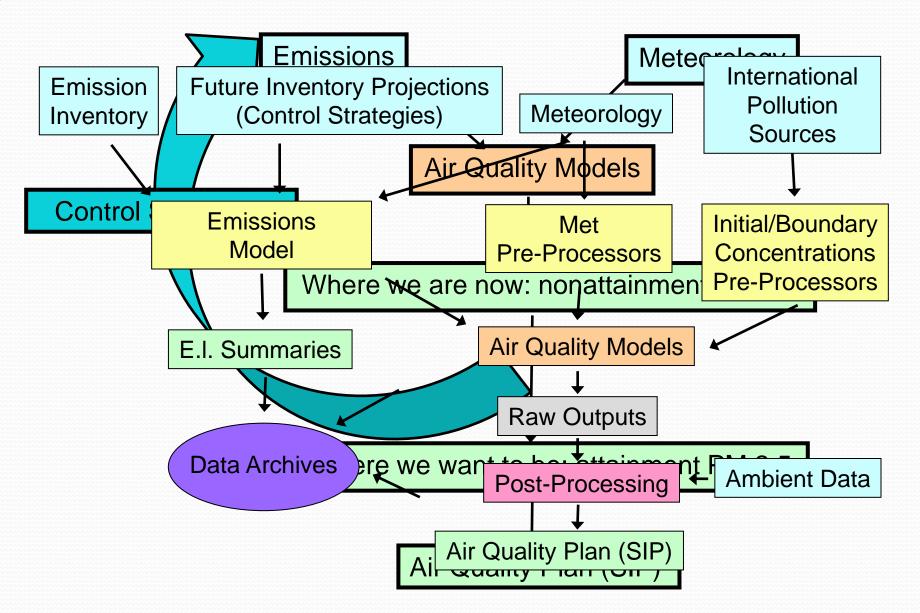
Who's Involved in the Modeling & What are They Doing?

- Borough, DEC and EPA staff organization, monitor operation, funding, direction & integration
- UAF air quality modeling, chemical analyses
- Penn State meteorological modeling
- CCHRC Space heating fuel use and wood moisture level
- University of Montana chemical analysis and modeling
- Sierra Research emissions inventory development and air quality modeling
- Washington University in St Louis analysis of black carbon measurements
- University of Massachusetts chemical tracer measurements
- OMNI-Test Laboratories space heating emission measurements

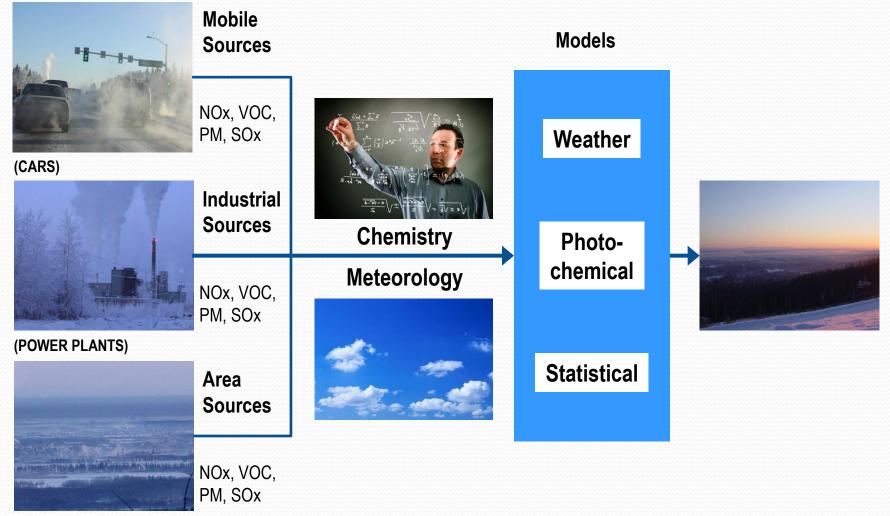
Fairbanks PM_{2.5} Nonattainment Area Modeling Grid

97,93	98,93	Jos	100.93	101,93	102,93	103,93	104,93	105,93	106,93	107,98	108,93	109,93	110,93	111,93	112,93	113,93	114,93	119 930	110.30	117,93	118,93	119,93	120,93	121,93	122,93	125(93	124,93	126,93	126,93	127,93	128,93	129,931	130,5
97,92	96,92	99,92	100,92	101,92	102,92	103,92	104,92	105,92	106,92	107.92	108,92	109,92	110,92	111,92	112,92	113.98	152	115,92	116,92	117.92	118.92	119,92	120,92	121,92	122.92	123,92	124,92	125,92	126,92	127,92	128,92	129,921	130,5
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97 90	98,90	99.90	100,90		102,90 WALDHE	1.	104,90	105,90	106,90	107.90	108,90	109,90	110,90	111,90	112,90	113,90	11490 SRUBST		116.90	117,90	118.90	119,90	120,90	MORE T	RL 122,90	123,90	124,90	125,90	126,90	127,90	128,90	129,901	130,5
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7,86	96,86	98,86	100,86	- Andrew -	1 4	103,86	104,86	105,86	106.86	107,86	108,86	109,86	110,86	113,88	112,86	113,86	114.86	15.88	116,80	117,88	==	A STATE OF T		RA'	ROAD	23.86	12796	35.00	128,88	127,86	128,86	129,861	130,
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84	98,84	99,84	100.84	101,84	102,84	103)84	104,84	N 105.84	106,84	VE 107,84	108.84 CO/	109,84	110,84	11184	112,84	113,84	AS DR E	115.84	116,84	17,84	118.84	119,84	120,84	121,84	122,84	123,84	124,84	125,84	126,84	127,84	128,84	29,841	130
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N	E	98.77	100,77	101,77	102,77	103,77	104,77	105,77	106,77	107,77	108,77	109,77	110,77	111,77	112,77	113,77	114,77	115.77	116,27	mart	118,77	119,77	120,77	2005	122.77 AVE	123,77	124.77 PLACK F	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			128,77	129,771	130
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,75	The	99,75	100,75	101,75	102,75	103,75	104,75	105,75	106,75	107,75	108,75	109,75	110,75	111,75	112,75	113,75	114,75	115,75	116,75	117,75	118,75	119,75	120,75	121,75	VELL DR 12276		-	126.76	-	127,75	128,75	129,751	130
.74	98,74	99,74	100,74	101,74	102,74	103,74	104,74	105,74	106,74	107,74	108,74	109,74	110,74	111,74	112,74	113,74	114,74	115,74	116,74	117,74	118,74	119,74	120,74	FIFT 121,74	H (NP)A	Contraction of	12474	129.74 0	128,74	127,74	128,74	129,741	130
,73	98,73	99,73	100,73	101,73	102,73	103,73	104,73	105,73	106,73	107,73	108,73	109,73	110,73	111,73	112,73	113,73	114,73	115,73	116,73	117,73	118,73	119,73	120,73	121,73	122,73	12373	2	120.75	126,73	127.73	128,73	129,731	130
7,72	98,72	99,72	100,72	101,72	102,72	103,72	104,72	105,72	106,72	107,72	108,72	109,72	110,72	111,72	112,72	113,72	114,72	115,72	116,72	117,72	118,72	119,72	120,72	121,72	122,72	123,72		126.72	128.75	1.72	128,72	129.721	130

Modeling Diagram



Key Fairbanks Modeling Steps



(HOME CHIMNEYS)





Fairbanks PM_{2.5} Air Quality Plan (SIP) Schedule

Task Name	DJFMAM			2012 M J J A S	ONF	J F M A M	013 J A S O N D		4 JASON
INVENTORY DEVELOPMENT				1	1				1
SPECIAL STUDIES/DATA ANALYSIS									1
Workshop									1
Symposium - Prep, Meeting & Summary									
REGULATORY MODELING									1
CMAQ						i i			i i
Receptor Modeling						i i			i i
Dispersion Modeling						i i			ļμ
Statistical Modeling				i	: 21	i i		i i	
CONTROL MEASURE ANALYSIS									
Identify/Assess Preliminary Strategies									.
Economic Analysis of Fuel Price Shifts				1	: 5				ATT AINMENT DAT
Assess Potential Borough Benefits				1					
Stakeholder Interaction				1					
Public Process			1 1						- F
Regulation Development									
SIP DEVELOPMENT									I I
Background Documentation				1					
Inventory Documentation									
Modeling Documentation			i i						
Initial Regulation Analysis		1							
Final Regulation Analysis			1						
Weight of Evidence									
Control Measure Documentation		i i	1 1						
Attainment Documentation									
Public Notice - SIP									
PCC Meetings									
Suggested Meetings									
Assembly Meetings									
Suggested Meetings		•							
State Public Comment and Adoption Process									
Prepare Regulation/Plan for State Public Comment									
State Public Comment Period									
Prepare State Package for Adoption									
Department of Law Review and Subsequent Adoptions						i i			
File Regulations at Lt. Governor									
Transmit SIP to EPA for Approval									

Control Measure Issues

- Existing control programs include:
 - Wood stove change out
 - Limit locations where new OWBs can be installed
 - Burn dry wood
 - Public education
- EPA has limits on voluntary measure benefits, additional resources and authority will be need to implement controls
 - Additional control measures will be needed to ensure attainment
 - Continue to look for input from public and Assembly on which measures to use

Options to Reduce Air Pollution

- Local options
 - Wood burning limits (sale of dry wood, etc.)
 - Shift to #1 heating oil as Borough has
 - Diesel retrofits
- State options
 - Wood burning limits (curtailment during episodes)
 - OWB standards
 - Limit wood cutting on public lands to only taking split wood
 - Permitted industrial facility emission controls
 - Large scale natural gas availability (e.g., pipeline)
- Federal options
 - Tighter wood stove standards (technology forcing)
 - National standards on fuels & equipment
 - Additional funds for local programs

Have to work together to assemble a mix of acceptable measures